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<b>UTILITY</b> <b>PATENT APPLICATION</b> <b>TRANSMITTAL</b> <i>(Only for new nonprovisional applications under 37 CFR 1.53(b))</i>	Attorney Docket No.	10751RNUS01U	Total Pages	34
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<b>APPLICATION ELEMENTS</b> See MPEP chapter 600 concerning utility patent application contents.	<b>ADDRESS TO:</b> Assistant Commissioner for Patents Box Patent Application Washington, DC 20231
1. <input checked="" type="checkbox"/> Fee Transmittal Form <i>(Submit an original, and a duplicate for fee processing)</i> 2. <input checked="" type="checkbox"/> Specification [Total Pages 24] <i>(preferred arrangement set forth below)</i> - Descriptive title of the Invention - Cross References to Related Applications - Statement Regarding Fed sponsored R & D - Reference to Microfiche Appendix - Background of the Invention - Brief Summary of the Invention - Brief Description of the Drawings <i>(if filed)</i> - Detailed Description - Claim(s) - Abstract of the Disclosure 3. <input checked="" type="checkbox"/> Drawing(s) <i>(35 USC 113)</i> [Total Sheets 3] 4. Oath or Declaration [Total Pages 2] a. <input checked="" type="checkbox"/> Newly executed (original or copy) b. <input type="checkbox"/> Copy from a prior application (37 CFR 1.63(d)) <i>(for continuation/divisional with Box 17 completed)</i> [Note Box 5 below] i. <input type="checkbox"/> <b>DELETION OF INVENTOR(S)</b> Signed statement attached deleting Inventor(s) named in the prior application, see 37 CFR 1.63(d) and 1.33 (b). 5. <input type="checkbox"/> Incorporation By Reference <i>(usable if Box 4b is checked)</i> The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied under Box 4b, is considered as being a part of the disclosure of the accompanying application and is hereby incorporated by reference therein.	6. <input type="checkbox"/> Microfiche Computer Program <i>(Appendix)</i> 7. <input type="checkbox"/> Nucleotide and/or Amino Acid Sequence Submission <i>(if applicable, all necessary)</i> a. <input type="checkbox"/> Computer Readable Copy b. <input type="checkbox"/> Paper Copy (identical to computer copy) c. <input type="checkbox"/> Statement verifying identity of above copies
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TITLE OF THE INVENTION

Firewall Control For Secure Private Networks  
With Public VoIP Access

FIELD OF THE INVENTION

The present invention relates generally to securely managing a pinhole opening in a firewall that protects a private network, the pinhole for use in communicating via Voice-over IP telephony.

BACKGROUND OF THE INVENTION

In the architecture defined by the Media Gateway Control (MEGACO) IETF Working Group, a typical H.248 model comprises media gateways (MGs) focusing on media translation and media gateway controllers (MGCs) focusing on call signaling and call processing functions.

Voice-over IP (VoIP) calls, sometimes referred to as Internet telephony, utilize a call signaling path between media gateway controllers, a media gateway control path between media gateway controllers and media gateways, and a bearer path. The call signaling path transfers call control data necessary to setup, connect and process a call. The media gateway control path is used by the media gateway controller to exchange data with the media gateways under its control. The bearer path is the actual voice data connection over which a conversation may take place. A media gateway port may have only one associated media gateway controller.

Private networks are generally protected from intrusion from public networks such as the Internet by firewalls that only permit certain pre-approved packet

streams through pinhole openings in the firewall. A pinhole opening in a firewall may also be referred to as a packet filter. Data packets are routed (or denied routing) based on, among other things, the source and destination address in the packet header including the port number. The packet filter works like a mask, allowing only data that meets specific criteria to pass. The specific criteria are a set of rules where each data packet is subjected to the set of rules. The firewall performs state-full inspection and subjects data packet content as well as data packet header information to the filtering rules that define the pinhole openings in the firewall.

Typically a firewall is directly controlled by a system administrator or the like through a pre-defined set of approved address pairs. Dynamic firewall control on a per call basis is desired for secure VoIP telephony between endpoints on either side of a firewall. Unfortunately, the present firewall control scheme does not permit remote dynamic control of a firewall from another private network entity.

Given the nature of the security risk and the design of VoIP systems, firewalls must be dynamically modified on a per call basis in order to avoid security breaches. Either the firewall must comprehend the call signaling protocol and derive the pinhole requirements, or an external device that understands the call signaling protocol must explicitly inform the firewall.

Firewalls have been interpreting known protocols and learning of pinhole requirements for some time. Doing so, however, implies continuous network infrastructure upgrades

as new protocols are introduced. Continuously upgrading network infrastructures increases the cost of and reduces the velocity of new service deployments. Alternatively, protocol specific "proxies" have been built which

5 understand specific protocols and are, in effect, a widening of the firewall - an alternate path into the secure private network for a specific protocol suite. Unfortunately, these implementations possess performance characteristics that cannot meet the requirements of VoIP  
10 media streams.

What is needed is a way to dynamically manage a pinhole in a private network firewall such that VoIP communication between endpoints on the private network and endpoints on a network beyond the firewall do not  
15 compromise the security of the private network.

#### SUMMARY OF THE INVENTION

In essence, the present invention treats a private network firewall as if it were a media gateway network  
20 entity. Doing so allows media gateway controllers to exchange messages with the firewall for purposes of securely setting up and tearing down pinholes in the firewall. Thus, a firewall can be remotely managed from another network entity broadly termed a firewall controller  
25 which may be, for instance, a media gateway controller call server. With this ability comes the ability to provide secure VoIP calls between public and private networks.

A call server that is approving the VoIP communication stream (e.g., a media gateway controller) requests, via a  
30 secure tunnel, that the firewall open a pinhole filter for

a specific source and destination address pair. The pinhole filter is then disabled when the session is complete. The pinhole open and pinhole close requests are made using either an MGCP (H.248) or COPS message pair.

According to one embodiment of the invention is a method of remotely controlling a firewall from a firewall controller in order to permit the flow of packet data through the firewall. The firewall controller can be a call server in a VoIP telephony system such as a media gateway controller. The method includes having the firewall controller determine the need for a pinhole in the firewall. This occurs when a media gateway endpoint on the secure side of the firewall either wishes to place a call to an endpoint outside the firewall or receive a call from an endpoint outside the firewall. Both of these events are made known to the media gateway endpoint's call server. The firewall controller sends a request to the firewall requesting that a pinhole be opened for a specific address pair corresponding to the respective media gateway endpoints involved in the call. The firewall carries out the request and opens a pinhole. Upon termination of the call, the firewall controller determines that the pinhole is no longer needed and sends a request to the firewall to close the pinhole. The firewall then closes the pinhole.

Other aspects and features of the present invention will become apparent to those ordinarily skilled in the art upon review of the following description of specific embodiments of the invention in conjunction with the accompanying figures.

BRIEF DESCRIPTION OF THE FIGURES

**FIGURE 1** is a typical network embodiment of a Media Gateway Control (MEGACO) architecture illustrating a packet data network call.

5       **FIGURE 2** is one network embodiment of an architecture illustrating a packet data network call between a private network and a public network that are separated by a firewall.

10       **FIGURE 3** is a flowchart illustrating the logic among the network entities illustrated in **FIGURE 2**.

DETAILED DISCLOSURE OF THE INVENTION

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15       One aspect of the H.248 Protocol is to control media gateways (MGs) for data packet networks utilizing call control elements and intelligence external to the media gateways. The external call control elements are generally referred to as media gateway controllers (MGCs). This includes, but is not limited to, voice over IP (VoIP), Voice-over ATM (VoATM) media gateways, and Voice-over any general packet data network.

20       A media gateway (MG) in a packet telephony system is a network element that provides conversion between the audio signals carried on standard switched circuit networks and data packets carried over the Internet or other packet data  
25       networks. H.248 assumes that the media gateway controllers will coordinate among themselves to send coherent commands to the media gateways under their control. As such, H.248 does not define a mechanism for coordinating media gateway controllers. H.248 is, in essence, a master/slave  
30       protocol, where the media gateways are expected to execute



commands sent by the media gateway controllers and report events for use by the media gateway controller. H.248 further assumes a connection model where the basic constructs are endpoints and connections. Endpoints are sources or sinks of data and may be physical or virtual.

One example of a physical endpoint is an interface on a media gateway that terminates a trunk connected to a PSTN switch (e.g., Class 5, Class 4, etc.). A media gateway that terminates trunks is called a trunk gateway. Another example of a physical endpoint is an interface on a media gateway that terminates an analog POTS (Plain Old Telephone Service) connection to a phone, key system, PBX, etc. A media gateway that terminates residential POTS lines (to phones) is called a residential POTS gateway or a loop access gateway. An example of a virtual endpoint is an audio source in an audio-content server. Creation of physical endpoints entails hardware installation, while creation of virtual endpoints can be done by software.

H.248 is designed as an internal protocol within a distributed system that appears to the outside as a single media gateway. The model is composed of a media gateway controller, that may or may not be distributed over several computer platforms, and of a set of media gateways. In a typical configuration, the distributed gateway system will interface on one side with one or more telephony (i.e. circuit) switches, and on the other side with H.323 or SIP conformant systems.

In the H.248 model, the media gateways focus on the audio signal translation function, while the media gateway controllers handle the call signaling and call processing

functions. As a result, the media gateway controller implements the "signaling" layers of the H.323 standard, and presents itself as an "H.323 Gatekeeper" or as one or more "H.323 Endpoints" to the H.323 systems.

5 H.248 assumes a connection model where the basic constructs are endpoints and connections. Connections are grouped in calls. One or more connections can belong to one call. Connections and calls are set up at the initiative of one or several media gateway controllers in which each  
10 media gateway controller operates on the data received from the previous media gateway controller in a serial fashion.

Connections may be either point-to-point or multi-point. A point-to-point connection is an association between two endpoints with the purpose of transmitting data  
15 between these endpoints. Once this association is established for both endpoints, data transfer between these endpoints can take place. A multi-point connection is established by connecting the endpoint to a multi-point session.

20 Connections can be established over several types of bearer path networks including transmission of audio packets using RTP and UDP over an IP network; transmission of audio packets using AAL2, or another adaptation layer, over an ATM network; and transmission of packets over an  
25 internal connection, for example the TDM backplane or the inter-connection bus of a gateway (this is used, in particular, for "hairpin" connections, connections that terminate in a gateway but are immediately re-routed over the telephone network).

Yet another example of an endpoint can be a firewall. A firewall is a construct within a private network that is typically used to separate a public access network from the private network. The firewall serves to protect the private network from unauthorized access while permitting specific data transfers (e.g., VoIP calls) between the public network and private network. Thus, a firewall can be made to respond to a media gateway controller by treating it as a physical endpoint. As such, it can receive and execute instructions or commands from a media gateway controller.

**FIGURE 1** illustrates a typical Media Gateway Control (MEGACO) network architecture in which a single media gateway controller **110** is utilized to control a call between a pair of media gateways **120A, 120B**. In this example, the calling endpoints are switches **130A, 130B** within the public switching telephone network (PSTN) **140**. The switches **130A, 130B** are connected to actual telephones which are not shown. A call signaling path (shown as a dotted line) is responsible for transferring call control data necessary to setup, connect and process a call. The call signaling path runs from one endpoint (switch **130A**) within the PSTN **140** into a signaling gateway **150** linked to a packet data network **160** (e.g., the Internet) into media gateway controller **110** and then back down to the other endpoint (switch **130B**) via packet data network **160** and signaling gateway **150** to the PSTN **140**.

The bearer path is the actual voice/data connection over which a conversation may take place. It also runs from PSTN switch endpoint **130A** to PSTN switch endpoint

130B. However, its route is different from the call signaling path. The bearer path leaves PSTN switch endpoint 130A and enters a media gateway 120A linked to packet data network 160 which is linked to a second media gateway 120B. Media gateway 120B then relays the bearer path to PSTN switch endpoint 130B.

Media gateway controller 110 controls media gateways 120A, 120B. To do so, however, requires a media gateway control protocol link 125 between media gateway controller 110 and each media gateway 120A, 120B.

Thus, media gateway controller 110 has bearer path access through a media gateway 120A, 120B via the media gateway control protocol link 125. Bearer path access is needed in order to detect specific events. Once a specific event is detected, media gateway controller 110 can issue call control commands or instructions to each endpoint 130A, 130B via the call signaling path 135.

FIGURE 2 is an extension of FIGURE 1 in that a firewall is added to the network architecture. The firewall is treated similar to a media gateway in that it can receive and follow commands from a media gateway controller.

On the private network side there is a media gateway controller 205 that can function as an IP PBX Call Server. Media gateway controller 205 is operatively connected to at least one media gateway endpoint 210 which can be an IP telephony device or a computer having IP telephony capability. The connection between media gateway controller 205 and media gateway endpoint 210 is via a media gateway control path 215. Media gateway controller

**205** is also a node on a Local Area Network (LAN) **220**.

Media gateway controller **205** is also operatively connected to a firewall **225** via a firewall control path **230**.

The public network side of the architecture shown in **FIGURE 2** is included for descriptive purposes. The present invention centers mainly on the signaling among media gateway controller **205** and its physical endpoints, specifically firewall **225**. The public network side includes a packet data network **250** such as the Internet, a second media gateway controller **255** acting as a central Office IP Call Server that serves other media gateway endpoints **260**, **265** via media gateway control path(s) **270**.

Private side media gateway controller **205** and public side media gateway controller **255** communicate directly with one another over a call signaling path **280** potentially via an optional secure tunnel such as an IPSec session pre-authorized through the firewall.

Media gateway controller **205** is the entity responsible for approving communication stream requests emanating from or terminating to media gateway endpoint(s) **210** within the private network. When a media gateway endpoint **210** wants to place a call, it initially reports an offhook event to media gateway controller **205**. Next the user keys in the number on the media gateway endpoint **210** he or she wishes to connect to. If the number is representative of another internal media gateway endpoint then media gateway controller **205** which is functioning as the IP PBX call server need not involve firewall **225**. Otherwise, if the number is representative of a media gateway endpoint **260** outside the private network, then media gateway controller

205 realizes the need to create a pinhole in firewall 225 before it can approve the communication stream. Media gateway controller 205, which is within the private network, communicates with media gateway controller 255 via call signaling path 280 in order to define the destination media gateway on the public network.

Similarly, if a call is incoming to a private side media gateway 210, private side media gateway controller 205 is contacted first by public network media gateway controller 255. The media gateway controllers 205, 255 exchange call signaling information regarding media gateway endpoints 210, 260.

At this point, media gateway controller 205 sends a request message to firewall 225 over a control path 230 requesting that firewall 225 open a pinhole to allow communication over bearer path 290. Communication will be between the network address pair corresponding to media gateway endpoints 210 and 260 in the private network and public network respectively. These endpoints were previously defined in an exchange between media gateway controllers 205 and 255.

Message exchanges between media gateway controller 205 and firewall 225 can be achieved using either the H.248 control protocol or the Common Open Policy Services (COPS) protocol. If H.248 is implemented then the firewall would need to be augmented to handle H.248 messaging such as for instance, an open connection request. The IP PBX call server (media gateway controller 205) would have to consider the firewall each time a call is made to or received from a media gateway endpoint outside the private

network. If COPS is implemented then the IP PBX call server (media gateway controller **205**) would be enhanced to support COPS policy messages received from firewall **225**.

The messages that need to be exchanged between media gateway controller **205** and firewall **225** relate to the creation and destruction of pinholes.

Once the firewall receives a request message to create a pinhole it executes the request and acknowledges the creation of the pinhole back to media gateway controller **205**. Now media gateway controller **205** can continue with normal establishment of the call between the media gateway endpoints in the private network and public network. When the call is terminated by one or both parties, media gateway controller **205** detects the termination via well known call signaling techniques and sends a request message to firewall **225** requesting that the pinhole be closed as there is no longer a need for it. Firewall **225** immediately closes the pinhole securing the private network.

**FIGURE 3** is a flowchart illustrating the logic among the network entities illustrated in **FIGURE 2**. Initially, the private network media gateway controller determines the need for a pinhole in the firewall **305**. This determination is the result of direct call signaling between media gateway controllers in the private and public network. Each media gateway controller controls at least one media gateway endpoint.

When a media gateway endpoint in one network wishes to communicate with (i.e., place a VoIP call to) a media gateway endpoint in another network, their respective media gateway controllers exchange call signaling messages for

the purpose of setting up and managing the call between the endpoints. The private network media gateway controller will either receive a request from one of its media gateway endpoints to communicate with another endpoint, or the  
5 private network media gateway controller will receive a request from another media gateway controller informing the private media gateway controller that a remote media gateway endpoint wishes to communicate with one of the private network media gateway controller's media gateway  
10 endpoints.

When either request is received, the private network media gateway controller first determines whether the source and destination endpoints are both within the private network. If they are, then the firewall need not be involved in setting up the call. If, however, one of the endpoints (either the source or destination) is outside the private network firewall, the private network media gateway controller realizes the need for a pinhole opening in the firewall and requests that a pinhole be opened for a specific source/destination address pair **310**. Upon  
receiving the request the firewall opens the pinhole for the specific address pair **315**. At this point, the private network media gateway controller sets up the call **320** using the pinhole filter just established. The source and  
25 destination media gateway endpoints may now communicate via VoIP. The private network is still protected by the firewall since a dynamic pinhole has been approved for this specific call only. Upon termination of the call, the connection is torn down between the endpoints **325**. At the  
30 same time, the private network media gateway controller



realizes that the pinhole filter is no longer required **330**  
and requests that the firewall close the pinhole **335**. The  
firewall then closes the pinhole filter **340**.

Media gateway controller **205** can be replaced by an  
5 apparatus generically termed a firewall controller. Such  
an apparatus would be able to remotely command a firewall  
**225** using COPS or H.248 for the purpose of determining when  
a pinhole is needed, creating a pinhole, determining when a  
pinhole is no longer needed, and closing pinhole. This  
10 device is not necessarily limited to managing and approving  
communication stream requests for a VoIP telephony  
application. It can be used to approve and manage data  
exchanges of all types between network address pairs in  
private and public networks.

One of the advantages of the present invention  
provides is a decoupling of the firewall from a pinhole  
implementation. Thus, a new controller having a secure  
relationship with the firewall can be added to the firewall  
as opposed to augmenting an existing controller. As a  
20 result deployment is a much simpler and less time consuming  
task.

It is to be understood that the present invention  
illustrated herein is readily implementable by those of  
ordinary skill in the art as a computer program product  
25 having a medium with a computer program embodied thereon.  
The computer program product is capable of being loaded and  
executed on the appropriate computer processing device(s)  
in order to carry out the method or process steps  
described. Appropriate computer program code in combination  
30 with hardware implements many of the elements of the

present invention. This computer code is often stored on storage media. This media can be a diskette, hard disk, CD-ROM, optical storage media, or tape. The media can also be a memory storage device or collection of memory storage devices such as read-only memory (ROM) or random access memory (RAM). Additionally, the computer program code can be transferred to the appropriate hardware over some type of data network.

The present invention has been described, in part, with reference to flowchart illustration(s). It will be understood that each block of the flowchart illustration(s), and combinations of blocks in the flowchart illustration(s), can be implemented by computer program instructions.

These computer program instructions may be loaded onto a general purpose computer, special purpose computer, or other programmable data processing apparatus to produce a machine, such that the instructions which execute on the computer or other programmable data processing apparatus create means for implementing the functions specified in the flowchart block(s).

These computer program instructions may also be stored in a computer-readable memory that can direct a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means which implement the function specified in the flowchart block(s). The computer program instructions may also be loaded onto a computer or other programmable data processing apparatus to cause a

series of operational steps to be performed on the computer or other programmable apparatus to produce a computer implemented process such that the instructions which execute on the computer or other programmable apparatus provide steps for implementing the functions specified in the flowchart block(s).

Accordingly, block(s) of flowchart illustration(s) or message diagram(s) support combinations of means for performing the specified functions, combinations of steps for performing the specified functions and program instruction means for performing the specified functions. It will also be understood that each block of flowchart illustration(s), and combinations of blocks in flowchart illustration(s) can be implemented by special purpose hardware-based computer systems that perform the specified functions or steps, or combinations of special purpose hardware and computer instructions.

In the following claims, any means-plus-function clauses are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Therefore, it is to be understood that the foregoing is illustrative of the present invention and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the scope of the appended claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.

CLAIMS:

1. A method of remotely controlling a firewall from a firewall controller in order to permit the flow of packet data through said firewall, the method comprising:

5        sending a request message from a firewall controller to a firewall requesting that a pinhole be opened;  
         opening a pinhole in said firewall;  
         sending a request message from a firewall controller to said firewall requesting that a pinhole be closed; and  
10        closing said pinhole.

2. The method of claim 1 further comprising:  
         determining the need for a pinhole in said firewall.

3. The method of claim 2 wherein said step of determining occurs at said firewall controller.

4. The method of claim 3 wherein said firewall controller is a media gateway controller.

5. The method of claim 1 further including the step of determining the need for a pinhole prior to sending a request that a pinhole be opened.

6. The method of claim 1 wherein said request messages are formatted in the H.248 protocol.

7. The method of claim 1 wherein said request messages are formatted in the common open policy services (COPS) protocol.

8. A firewall controller for permitting the flow of packet data, said firewall controller comprising:

means for determining a need for a pinhole in a  
5 firewall;

means for sending a request message to said firewall requesting that a pinhole be opened in said firewall; and

means for sending a request message to said firewall requesting that said pinhole be closed in said firewall.

9. The firewall controller of claim 8 wherein said request messages are formatted in the H.248 protocol.

10. The firewall controller of claim 8 wherein said request messages are formatted in the common open policy services (COPS) protocol.

11. The firewall controller of claim 8 wherein said firewall controller is a media gateway controller.

12. A firewall responsive to a firewall controller for permitting the flow of packet data, said firewall comprising:

means for receiving a request message from said  
25 firewall controller requesting that a pinhole be opened in said firewall;

means for opening a pinhole in said firewall;

means for receiving a request message from said  
firewall controller requesting that said pinhole be closed  
30 in said firewall; and

means for closing said pinhole in said firewall.

13. The firewall of claim 12 wherein said request messages are formatted in the H.248 protocol.

5

14. The firewall of claim 12 wherein said request messages are formatted in the common open policy services (COPS) protocol.

10 15. A firewall responsive to a media gateway controller for permitting the flow of packet data, said firewall comprising:

means for receiving a request message from said media gateway controller requesting that a pinhole be opened in said firewall;

means for opening a pinhole in said firewall;

means for receiving a request message from said media gateway controller requesting that said pinhole be closed in said firewall; and

means for closing said pinhole in said firewall.

16. A computer program product for remotely controlling a firewall from a firewall controller in order to permit the flow of packet data through said firewall, the computer program product having a medium with a computer program embodied thereon, the computer program product comprising:

computer program code in said firewall controller for sending a request message to said firewall requesting that a pinhole be opened; and

computer program code in said firewall for opening a pinhole;

computer program code in said firewall controller for sending a request message to said firewall requesting that  
5 said pinhole be closed; and

computer program code for in said firewall for closing said pin hole.

17. The computer program product of claim 16 further  
10 comprising:

computer program code in said firewall controller for determining the need for a pinhole in said firewall.

18. The computer program product of claim 16 wherein said request messages are formatted in the H.248 protocol.

19. The computer program product of claim 16 wherein said request messages are formatted in the common open policy services (COPS) protocol.

20. The computer program product of claim 17 wherein said firewall controller is a media gateway controller.

21. A computer program product in a firewall controller,  
25 said firewall controller operative with a firewall, the computer program product having a medium with a computer program embodied thereon, the computer program product comprising:

computer program code for determining the need for a  
30 pinhole in said firewall;

computer program code for sending a request message to  
said firewall requesting that a pinhole be opened in said  
firewall; and

5 computer program code for sending a request message to  
said firewall requesting that said pinhole be closed in  
said firewall.

22. The computer program product of claim 21 wherein said  
request messages are formatted in the H.248 protocol.

10

23. The computer program product of claim 21 wherein said  
request messages are formatted in the common open policy  
services (COPS) protocol.

15

24. The computer program product of claim 21 wherein said  
firewall controller is a media gateway controller.

20

25. A computer program product in a firewall, said  
firewall responsive to a firewall controller, the computer  
program product having a medium with a computer program  
embodied thereon, the computer program product comprising:

computer program code for receiving a request message  
from said firewall controller requesting that a pinhole be  
opened in said firewall;

25

computer program code for opening a pinhole in said  
firewall;

computer program code for receiving a request message  
from said firewall controller requesting that said pinhole  
be closed in said firewall; and



computer program code for closing said pinhole in said firewall.

26. A computer program product in a firewall, said  
5 firewall responsive to a media gateway controller, the  
computer program product having a medium with a computer  
program embodied thereon, the computer program product  
comprising:

10 computer program code for receiving a request message  
from said media gateway controller requesting that a  
pinhole be opened in said firewall;

computer program code for opening a pinhole in said  
firewall;

15 computer program code for receiving a request message  
from said media gateway controller requesting that said  
pinhole be closed in said firewall; and

computer program code for closing said pinhole in said  
firewall.

20 27. A computer system for remotely controlling a firewall  
from a firewall controller comprising:

a firewall operatively connected to a private computer  
network and at least one external computer network;

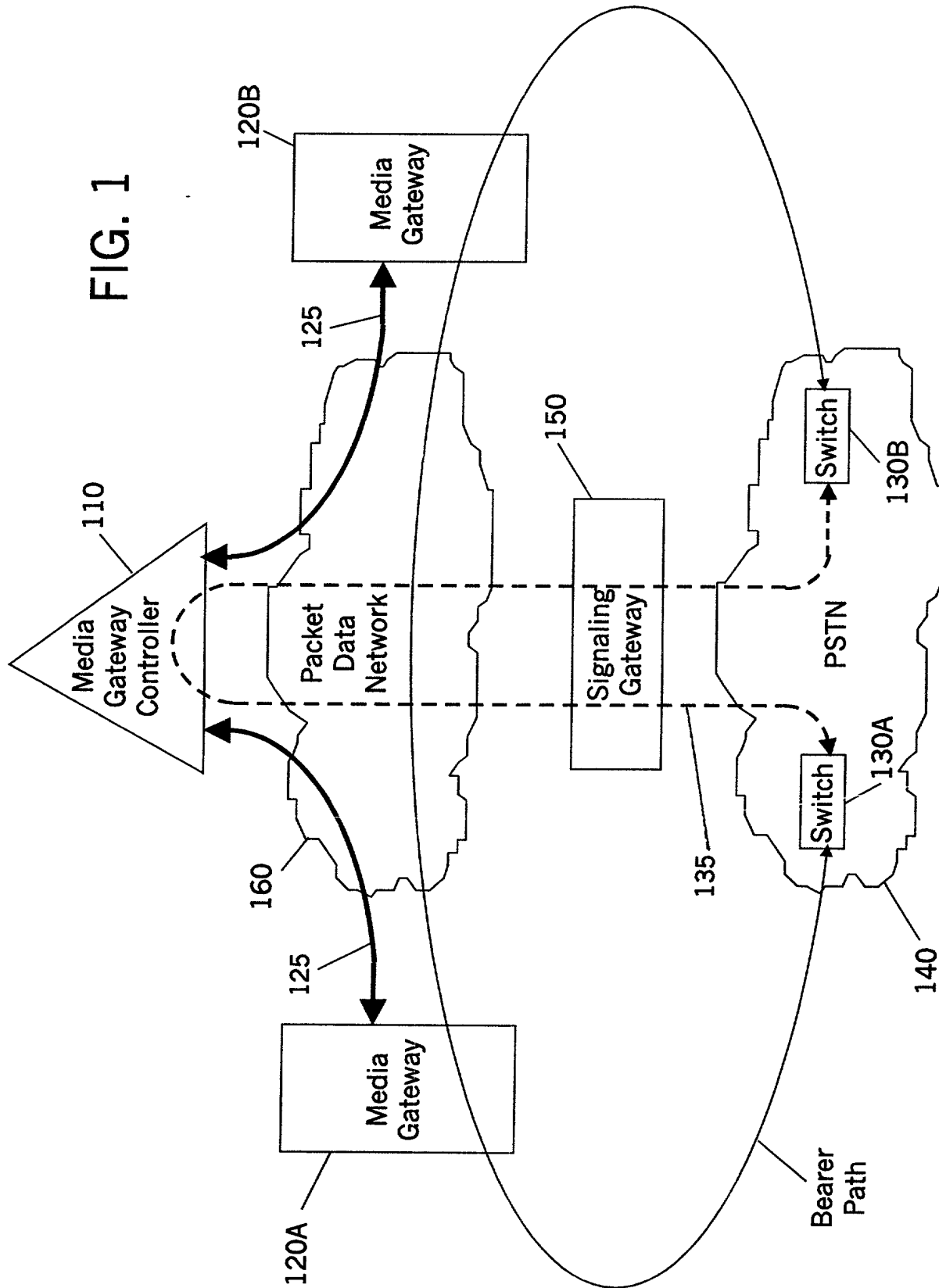
25 a firewall controller operatively connected to said  
firewall for remotely instructing said firewall to open and  
close pinholes in said firewall.

30 28. The computer system of claim 27 wherein said firewall  
controller is a media gateway controller acting as a call  
server in a VoIP telephony network.



ABSTRACT

5           A private network firewall **225** is treated as if it  
were a media gateway network entity. Doing so allows a  
media gateway controller **205** to exchange messages with the  
firewall **225** for purposes of securely setting up and  
tearing down pinholes in the firewall. With this ability  
10 comes the ability to provide secure VoIP calls between  
public **250** and private **220** networks. A call server or  
media gateway controller **205**, that is approving the VoIP  
communication stream in a private packet data network  
requests, via a secure tunnel **230**, that the firewall **225**  
15 open a pinhole filter for a specific source and destination  
address pair corresponding to media gateway endpoints, **210**  
and **260** respectively, using either MGCP (H.248) or COPS  
messages, for instance. The pinhole filter is then  
disabled when the session is complete.



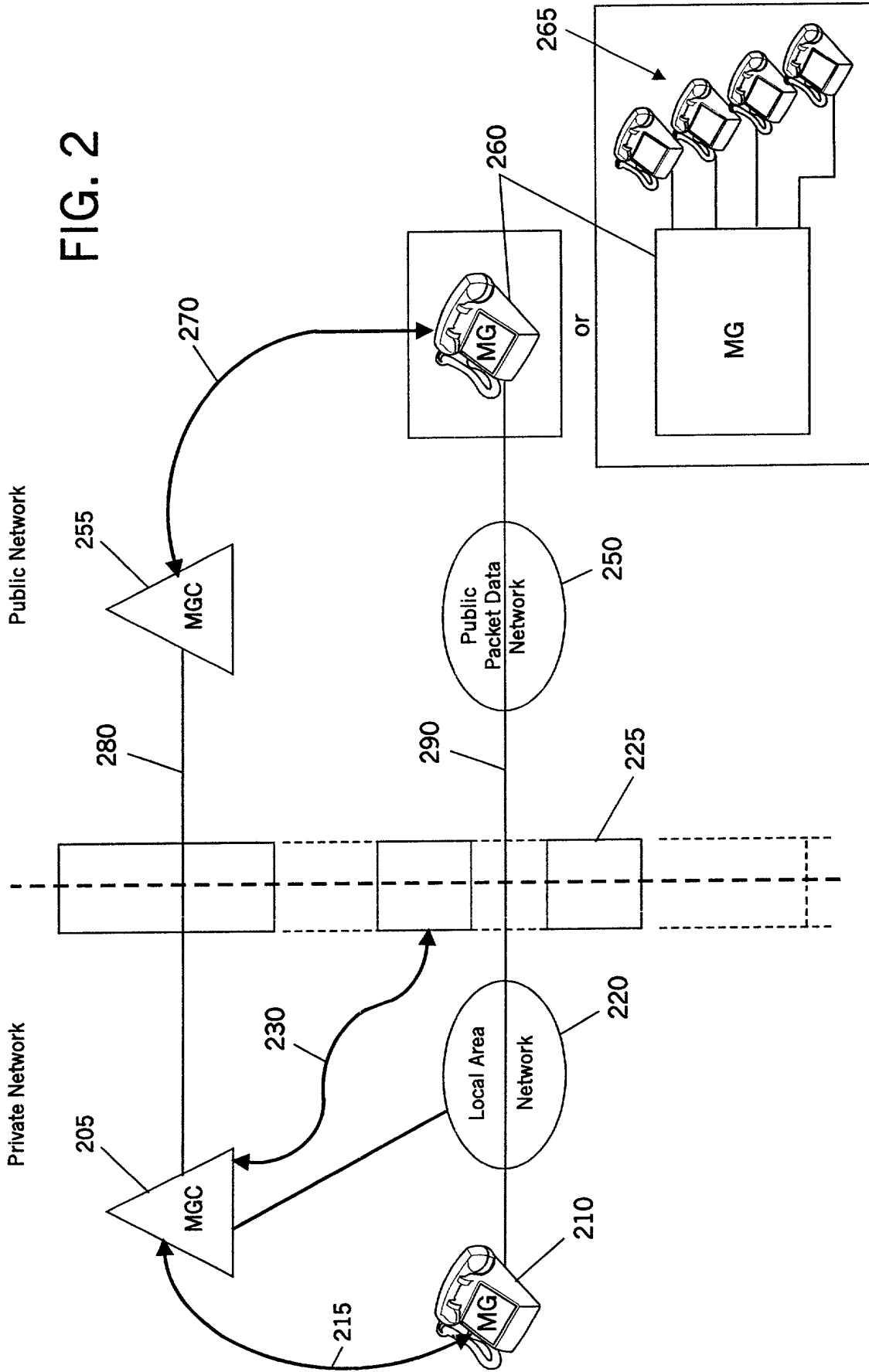
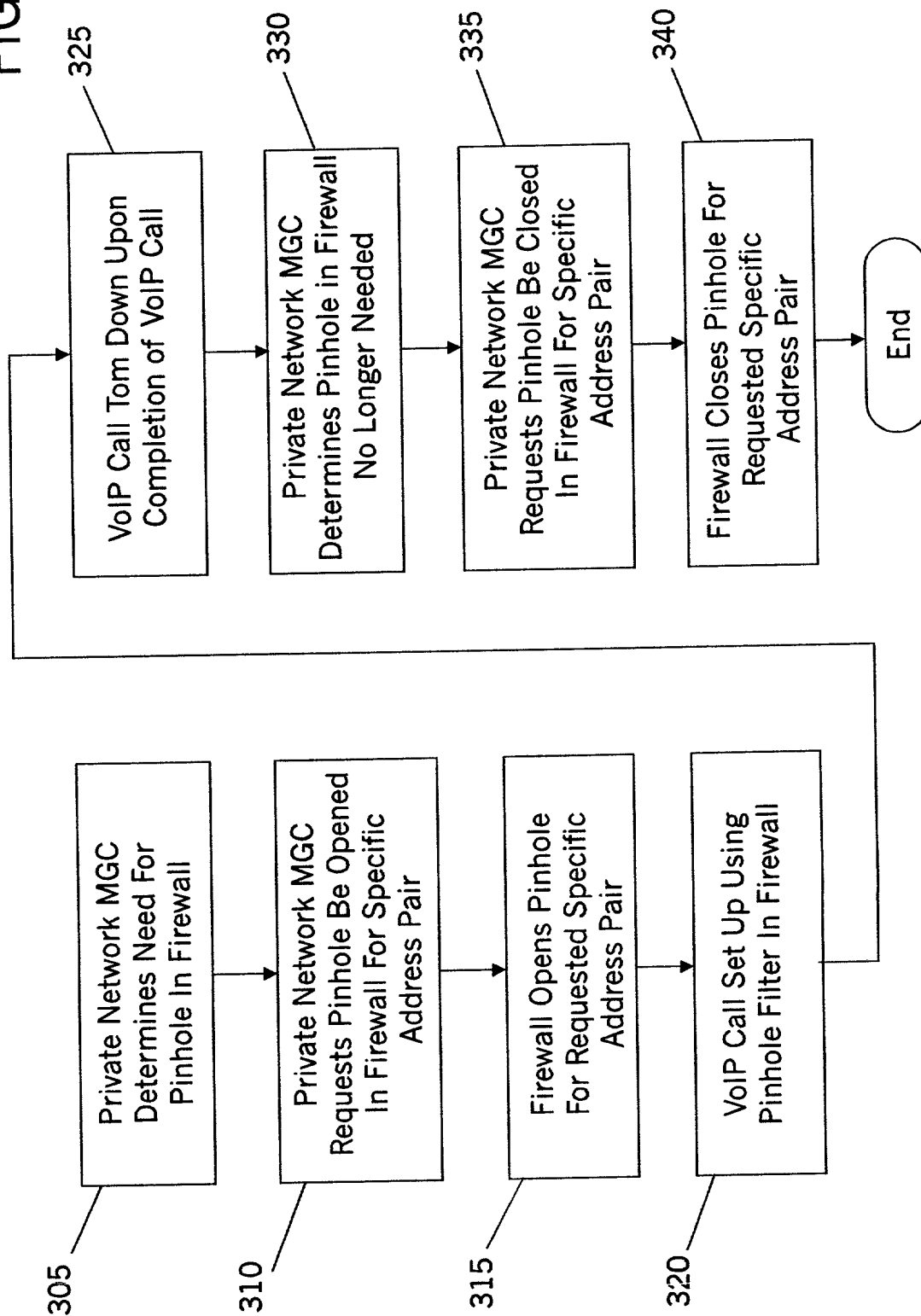


FIG. 3



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+

<b>DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)</b>	<b>Attorney Docket Number</b>	10751RNUS01U
	<b>First Named Inventor</b>	CHRISTIE, S.
	<b>COMPLETE IF KNOWN</b>	
	<b>Application Number</b>	
	<b>Filing Date</b>	
	<b>Group Art Unit</b>	
<input checked="" type="checkbox"/> <b>Declaration Submitted with Initial Filing</b>	<b>OR</b>	<input type="checkbox"/> <b>Declaration Submitted after initial Filing (surcharge (37 CFR 1.16(e)) required)</b>
<b>Examiner Name</b>		

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

Firewall Control For Secure Private Networks With Public VoIP Access

the specification of which

☒ is attached hereto  
OR

☐ was filed on (MM/DD/YYYY) , as United States Application Number or PCT International  
Application Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 3659a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) listed below.

Application Number(s)	Filing Date (MM/DD/YYYY)	<input type="checkbox"/> Additional provisional application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto

## DECLARATION – Utility or Design Patent Application

I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

☐ Additional U.S. or PCT international application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto

As a named inventor, I hereby appoint the following registered practitioner(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: ☐ Customer Number ☐ OR ☐

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Name	Registration Number	Name	Registration Number
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Gregory A. Stephens	41,329	John H. Vynalek	37,254

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

**Name of Sole or First Inventor:** ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle (if any))	Family Name or Surname
SAMUEL H. IV	CHRISTIE

Inventor's Signature		Date	7/24/09
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☐ Additional inventors are being named on the supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.